



# STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR  
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES  
CHUCK GIPP, DIRECTOR

## Permit Rationale

**Date:** December 31, 2015

**Permit Writer:** Brandy Beavers

**Facility Name:** City of Waterloo STP

**Location:** County: Blackhawk  
Latitude: 42 degrees 28 minutes 18 seconds  
Longitude: 92 degrees 18 minutes 18 seconds

**Region/FO:** 1, Manchester

### Design:

**Easton Ave WWTP (Outfall 001):** Discharge to Cedar River (A1, B(WW-1), HH) via river diffuser

Treatment: Activated Sludge  
Date constructed: 1998  
Flow: ADW: 12.7 MGD, AWW: 26.7 MGD, MWW: 36.0 MGD  
Design BOD5: 30,000 LBS/day, TKN: 7,500 LBS/day, P.E. 179,641  
Source: Construction Permit 98-361-S, issued August 21, 1998  
and schedule G dated March 11, 1998

**Satellite WWTP: (Outfall 008):** Discharge to Cedar River (A1, B(WW-1), HH) via river diffuser

Treatment: Activated Sludge  
Date constructed: 1995  
Flow: ADW: 5.3 MGD, AWW: 8.1 MGD, MWW: 11.1 MG  
Design: BOD5 58,000 LBS/day, TKN: 13,550 LBS/day, P.E. 347,305  
Source: Construction Permit 95-317-S, issued July 7, 1995

**Treatment Plant Description:** The treatment plant consists of two equalization basins and two treatment facilities; the Easton Avenue Plant and Satellite Plant. The facility receives waste from two separate dedicated trunk lines. Industrial waste from the Northeast section of the city, currently consisting of pretreated waste from Tyson and Eagle Tanning, is sent to the Satellite Plant, while the rest of the City's waste is sent to the Easton Avenue Plant via the other line. Industrial wastewater arriving at the Satellite Plant can be treated at the Satellite plant or diverted to the Easton Avenue Plant. The Satellite Plant is currently not in operation and all wastewater is treated at the Easton Plant.

Wastewater at the Easton Avenue Plant is sent to the bar screening building followed by the grit removal building. Wastewater then flows to one of two primary clarifiers (normally only one

clarifier is in operation at a time). From the primary clarifier wastewater flow to one of four single-pass aeration basins; each aeration basin consists of three treatment zones. The first zone is aerated with coarse bubble aerators and the final two with fine bubble aerators. Effluent from the aeration basins is then sent to one of four final clarifiers before being through an ultraviolet disinfection chamber. Effluent is then discharged via a river diffuser (outfall 801).

When in operation, the Satellite Plant receives pretreated industrial wastewater. Raw wastewater is sent to one of two, two-stage aeration basins. Effluent from the aeration basins flows to one of four final clarifiers (outfall 008). When not in operation, wastewater from this truck line arrives at the Satellite pumping station and is routed directly to the Easton plant aeration basins, bypassing the headworks and primary clarification. The wastewater from the Tannery and Tyson's is pretreated prior to discharging to the Satellite trunk line at the anaerobic lagoon located near the Tyson facility.

Raw wastewater samples for the Easton Avenue Plant are collected at the pump building after solids removal but prior to grit removal. Raw wastewater samples for the Satellite Plant are collected at the pump building prior to being sent to the Satellite Plant or diverted to the Easton Plant.

Effluent samples, from both treatment plants, are collected following final clarification, prior to UV disinfection (Outfalls 001 and 008). Additional effluent samples can be taken after disinfection at Outfall 801 or 011. Outfall 801 (river diffuser) is the primary outfall. When river levels become elevated, the wastewater can be diverted to the shoreline and discharged at Outfall 011. Outfall 009 is the shoreline discharge at lower flows and is considered a bypass. Outfall 011 and 009 are at the same location.

**Blending Mode of Operations:** The City may operate their wastewater treatment plant in the following mode only during peak influent flow conditions. This alternative mode of operation will be authorized on a temporary basis for the one permit cycle and is not subject to extension.

Influent flows that exceed the hydraulic capacity of the Easton Avenue plant are diverted to two-flow equalization basins (FEQ) after passing through grit removal. Flows stored in the FEQ basins are returned to the Easton Wet Well once the Easton Avenue plant regains hydraulic capacity. In the event that the Easton Avenue plant has yet to regain hydraulic capacity, the flow from the FEQ will be diverted to the Satellite plant. The flows from the FEQ will be routed through the Satellite plant and returned to the headworks of the Easton Avenue plant via portable pumps. If the biological system at the Easton Avenue Plant could be jeopardized due to excessive flows, the partially treated wastewater from the Satellite plant will be diverted to the disinfection chamber and blended with the final effluent from the Easton plant. Once the Easton Avenue plant regains hydraulic capacity the facility is no longer authorized to blend the FEQ overflow via the Satellite plant.

**Sludge Handling and Disposal:** Easton Avenue Plant- Sludge from the primary clarifiers is pumped to the Treated Activated Sludge (TAS) building for dewatering. Sludge from the final clarifiers is pumped to either the Return Activated Sludge (RAS) building and returned to the aeration basins or Waste Activated Sludge (WAS) building. WAS is pumped to the sludge thickener building, and the thickened sludge is pumped to the TAS building. Supernatant is

pumped back to the aeration basins. TAS is treated in two parallel digester units, each consisting of one thermophilic and two mesophilic digesters. Methane gas from last digester in each unit is captured and used in the facility's boilers. Excess gas is flamed off.

Satellite Plant- Sludge from the final clarifiers is pumped to either the RAS building for the Satellite plant or to the WAS building. RAS is pumped back to the aeration basins and WAS follows the treatment process described above.

Treated sludge is pumped to sludge storage tanks, and hauled to a sludge storage structure south of Waterloo before being land applied.

**Wasteload Allocation (WLA):** See attached WLA calculated May 21, 2015. The additive flows of the Easton plant and the Satellite plant were used to calculate the Water Quality Based Effluent Limits (WQBEL): ADW: 18.0 MGD, AWW: 34.8 MGD, MWW: 47.1 MGD

**Antidegradation:** On May 20, 2015, the existing surface water uses were evaluated using the best information currently available to the department and concluded that compliance with the permit limits will maintain and protect existing surface water uses resulting in no degradation.

**Impaired Waterbody:** The Cedar River, Iowa River and Mississippi River are listed on Iowa's 2012 Impaired Waters List (303(d) list) due to several impairments. Two TMDL's have been completed for the Cedar River, one for Nitrate Nitrogen (2006) and one for E.coli (2010). No other TMDLs have been completed at this time. If, at the time a TMDL is completed, it is determined this discharge contributes to the impairment and the limits in the TMDL are more stringent than the permit, the permit may be modified to reflect the requirements of the TMDL.

The 2006 Nitrate TMDL for the Cedar River, the City of Waterloo was assigned an allocation which was inaccurate. See WLA dated May 21, 2015 for further detail.

All limits in the proposed permit are consistent with the approved TMDLs.

**Final Limits for Outfall 001:**

Parameter	Season	7-day ave mg/l	30-day ave mg/L	daily max mg/L	7-day ave lbs/day	30-day ave lbs/day	daily max lbs/day	Geo - mean	Min	Max
TSS	Yearly	45	30	---	---	---	---	---	---	---

**Basis for limits at outfall 001:** TSS concentration limits are based on secondary treatment standards.

**Final Limits for Outfall 008:**

Parameter	Season	7-day ave mg/l	30-day ave mg/L	daily max mg/L	7-day ave lbs/day	30-day ave lbs/day	daily max lbs/day	Geo - mean	Min	Max
TSS	Yearly	45	30	---	---	---	---	---	---	---

**Basis for limits at outfall 008:** TSS concentration limits are based on secondary treatment standards.

**Final Limits for Outfall 801:**

Parameter	Season	7-day ave mg/l	30-day ave mg/L	daily max mg/L	7-day ave lbs/day	30-day ave lbs/day	daily max lbs/day	Geo - mean	Min	Max
BOD5	Yearly	45	30	---	13,060	8707	---	---	---	---
TSS	Yearly	---	---	---	13,060	8707	---	---	---	---
Ammonia (NH <sub>3</sub> )	January	---	37.5	79.7	---	6,347	14,110	---	---	---
	February	---	42.6	91.2	---	7,202	15,687	---	---	---
	March	---	18.7	68.3	---	3,198	12,353	---	---	---
	April	---	13.1	52.8	---	2,268	10,273	---	---	---
	May	---	11.1	52.1	---	1,918	10,080	---	---	---
	June	---	7.2	50.5	---	1,269	6,791	---	---	---
	July	---	8.6	40.3	---	1,436	5,369	---	---	---
	August	---	7.8	44.1	---	1,310	5,892	---	---	---
	September	---	8.3	46.3	---	1,452	6,182	---	---	---
	October	---	18.8	60.4	---	3,212	11,374	---	---	---
	November	---	23.5	51.5	---	4,006	9,894	---	---	---
	December	---	27.8	60.8	---	4,732	11,470	---	---	---
pH	Yearly	---	---	---	---	---	---	---	6.0	9.0
<i>E. coli</i>	Summer	---	---	---	---	---	---	126	---	---
Total Nitrogen		---	---	---	---	9,285.5	15,199.0	---	---	---

**Basis for limits at outfall 801:**

TSS mass limits are based on secondary treatment standards. The additive design of the Easton and Satellite POTW's was used to calculate the mass limits.

BOD5 limits are being included in the proposed permit. The ammonia nitrogen limits included in the proposed permit are protective of the receiving stream, but does not ensure that complete nitrification is happening within the treatment facility. The nitrification process has high oxygen demand. The Nitrogenous Biochemical Oxygen Demand (NBOD) portion of BOD may be elevated and would not be captured with the CBOD5 test. The NBOD levels are especially a concern during the use of the blending mode of operation as nitrification would not be occurring as a portion of the wastewater is diverted around secondary treatment. Also, CBOD5 alone cannot accurately reflect overall removal efficiency of the treatment facility during the blending mode of operation. According to the preamble to the 1984 rulemaking (Federal Register 9/20/1984) the intent to use CBOD5 as an alternative to BOD5 was in facilities that where nitrification was significant part of the treatment process. The proposed limit is based on best professional judgement and set equivalent to the technology based effluent limit (40 CFR 133.102)

The pH limits are based on secondary treatment standards.

The *E. coli* limit is based on WQBELs as detailed in the WLA dated May 21, 2015. The facility began operating their UV disinfection unit in 2013. Since that time, the average *E.coli* level was 27.14 org/100 mL. The maximum level recorded was 157 mpn/100 mL in October of 2014. The limits will be included in the permit to ensure that the facility continuously runs their disinfection unit and will continuously meet the WQBELs.

The sulfate and chloride sample results submitted with the application were 164 mg/L and 218 mg/L, respectively. As of November 11, 2009, the Department adopted chloride and sulfate water quality standards (WQS). The sample results for chloride and sulfate provided are below the water quality based effluent limit necessary to protect the receiving streams (see WLA dated May 21, 2015). No effluent limitations or additional monitoring is proposed for sulfate or chloride.

The facility was required to submit test results for ammonia nitrogen, dissolved oxygen (DO), nitrate+nitrite as nitrogen, phosphorus, oil and grease, and Total Kjeldahl Nitrogen (TKN).

The Ammonia (as N) has been as high as an average concentration of 60.8 mg/L within the last permit cycle (maximum concentration of 64.3 mg/L). However, in the last 5 years, whenever the effluent levels reached greater than 7.0 mg/L, the facility was employing less than 30% of the facilities treatment capacity (based on the reported MLSS for each aeration basin). The Department believes that if the treatment plant is operating as designed, the ammonia nitrogen limits can be met on a consistent basis. The facility is not eligible to get a compliance schedule to meet the more stringent limits as the requirement to meet the limits is as soon as possible. The facility currently has the technology in place to comply with the ammonia limits.

The Cedar River Total Nitrogen limits are based on the WLA dated May 21, 2015. The allocation given is different from the allocated listed within the TMDL due to only one of the two treatment plants were used to calculate the TMDL WLA. The corrected WLA is consistent with the

calculations used for all facilities within the TMDL. After the allocation was calculated to be consistent with the TMDL, the loads were converted to 30-day average and daily maximum limits.

The DO sample results submitted via email gave a concentration level of 1.81 mg/L. Different combinations of effluent CBOD5/Ammonia nitrogen/total DO could have the same impact on the receiving stream DO level. Since the maximum CBOD5 level is capped by the technology based limit, the ammonia nitrogen and DO limits can be adjusted simultaneously in some degree and not cause the receiving stream DO level below 5.0 mg/l. If the facility does not violate the ammonia nitrogen limits from the WLA the receiving stream DO will not be lower than 5.0 mg/L therefore no minimum DO limit is proposed in the permit.

The WQS for nitrate + nitrite as nitrogen only applies to Class “C” waters. The Cedar River is not a Class “C” water therefore no reasonable potential to violate the WQS exists. However, Total Nitrogen (which includes nitrate + nitrite as nitrogen) influent and effluent monitoring is included in the proposed permit as part of the State’s nutrient reduction strategy.

<4.2 mg/L of oil and grease was reported in the application. In most cases, if oil and grease is less than 10 mg/L no visible sheen is present, therefore the facility meets the States narrative standard for oil and grease and no monitoring or limits are included in the proposed permit.

The maximum phosphorus and TKN sample results were 11.1 mg/L and 26.3 mg/L respectively. The average daily value for phosphorus and TKN are 8.79 mg/L and 5.39 mg/L respectively. The State does not currently have a WQS for phosphorus or TKN. Phosphorus and TKN influent monitoring and phosphorus final effluent monitoring is included in the proposed permit.

The data submitted with part B of the renewal application showed that the City of Waterloo does have levels of 1,1,1-Trichloroethane, Benzidine, Bis(2-ethylhexyl)phthalate, Copper, Dichloromethane, Nickel, and Zinc in its discharge. The sample results for the aforementioned parameters were less than WQBELs and the Department does not feel that there is a reasonable potential for this facility to violate the WQS for these parameters. Therefore, no limits or monitoring are included in the proposed permit for 1,1,1-Trichloroethane, Benzidine, Bis(2-ethylhexyl)phthalate, Copper, Dichloromethane, Nickel, and Zinc.

There was also a detectable amount of Dibutyl phthalate present in the effluent. A statistical reasonable potential analysis concluded that no reasonable potential for an effluent violation is present. The Department has not proposed monitoring or limits in the draft permit at this outfall.

The effluent samples for Hexachlorobenzene were all non-detectable values. However, the lowest available detection level is well above the WQBEL. The Department considers a non-detection, at the lowest available detection level, as compliance with a WQBEL. If the Departments obtains further information that would indicate that the presence of Hexachlorobenzene is likely, the permit will be reopened and the appropriate monitoring and limits will be included.

**Final Limits for Outfall 011:**

Parameter	Season	7-day ave mg/l	30-day ave mg/L	daily max mg/L	7-day ave lbs/day	30-day ave lbs/day	daily max lbs/day	Geo - mean	Min	Max
BOD5	Yearly	45	30	---	13,060	8707	---	---	---	---
TSS	Yearly	---	---	---	13,060	8707	---	---	---	---
Ammonia (NH <sub>3</sub> )	January	---	104.2	104.2	---	17,791	17,791	---	---	---
	February	---	120.6	120.6	---	20,091	20,091	---	---	---
	March	---	88.6	88.6	---	15,404	15,404	---	---	---
	April	---	66.5	66.5	---	12,343	12,343	---	---	---
	May	---	65.8	65.8	---	12,146	12,146	---	---	---
	June	---	64.8	64.8	---	10,079	11,864	---	---	---
	July	---	73.0	73.0	---	12,696	13,673	---	---	---
	August	---	62.2	62.2	---	11,578	11,846	---	---	---
	September	---	76.5	78.2	---	11,693	14,193	---	---	---
	October	---	77.1	77.1	---	13,895	13,895	---	---	---
	November	---	65.1	65.1	---	11,956	11,956	---	---	---
	December	---	77.5	77.5	---	13,992	13,992	---	---	---
pH	Yearly	---	---	---	---	---	---	---	6.0	9.0
<i>E. coli</i>	Summer	---	---	---	---	---	---	126	---	---
Total Nitrogen		---	---	---	---	9,285.5	15,199.0	---	---	---

**Basis for limits at outfall 011:**

CBOD<sub>5</sub> limits are based on secondary treatment standards. The additive design of the Easton and Satellite POTW's was used to calculate the mass limits.

TSS mass limits are based on secondary treatment standards. The additive design of the Easton and Satellite POTW's was used to calculate the mass limits.

The pH limits are based on secondary treatment standards.

The *E. coli* limit is based on WQBELs as detailed in the WLA dated May 21, 2015. The facility began operating their UV disinfection unit in 2013. Since that time, the average *E.coli* level was 27.14 org/100 mL. The maximum level recorded was 157 mpn/100 mL in October of 2014. The limits will be included in the permit to ensure that the facility continuously runs their disinfection unit and will continuously meet the WQBELs.

The sulfate and chloride sample results submitted with the application were 164 mg/L and 218 mg/L, respectively. As of November 11, 2009, the Department adopted chloride and sulfate water quality standards (WQS). The sample results for chloride and sulfate provided are below the water quality based effluent limit necessary to protect the receiving streams (see WLA dated May 21, 2015). No effluent limitations or additional monitoring is proposed for sulfate or chloride.

The facility was required to submit test results for ammonia nitrogen, dissolved oxygen (DO), nitrate+nitrite as nitrogen, phosphorus, oil and grease, and Total Kjeldahl Nitrogen (TKN).

The Ammonia (as N) reported in the DMR for the last permit cycle was analyzed and the data indicated compliance with the WQBEL for outfall 011. The proposed permit will include Ammonia (as N) limits for outfall 011 with no compliance schedule.

The Cedar River Total Nitrogen limits are based on the WLA dated May 21, 2015. The allocation given is different from the allocated listed within the TMDL due to only one of the two treatment plants were used to calculate the TMDL WLA. The corrected WLA is consistent with the calculations used for all facilities within the TMDL. After the allocation was calculated to be consistent with the TMDL, the loads were converted to 30-day average and daily maximum limits.

The DO sample results submitted via email gave a concentration level of 1.81 mg/L. Different combinations of effluent CBOD5/Ammonia nitrogen/total DO could have the same impact on the receiving stream DO level. Since the maximum CBOD5 level is capped by the technology based limit, the ammonia nitrogen and DO limits can be adjusted simultaneously in some degree and not cause the receiving stream DO level below 5.0 mg/l. If the facility does not violate the ammonia nitrogen limits from the WLA the receiving stream DO will not be lower than 5.0 mg/L therefore no minimum DO limit is proposed in the permit.

The WQS for nitrate + nitrite as nitrogen only applies to Class "C" waters. The Cedar River is not a Class "C" water therefore no reasonable potential to violate the WQS exists. However, Total Nitrogen (which includes nitrate + nitrite as nitrogen) influent and effluent monitoring is included in the proposed permit as part of the State's nutrient reduction strategy.

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The data submitted with part B of the renewal application showed that the City of Waterloo does have levels of 1,1,1-Trichloroethane, Benzidine, Bis(2-ethylhexyl)phthalate, Copper, Dibutyl phthalate, Dichloromethane, Nickel, and Zinc in its discharge. The sample results for the aforementioned parameters were less than WQBELs and the Department does not feel that there is a reasonable potential for this facility to violate the WQS for these parameters. Therefore, no limits

or monitoring are included in the proposed permit for 1,1,1-Trichloroethane, Benzidine, Bis(2-ethylhexyl)phthalate, Copper, Dibutyl phthalate, Dichloromethane, Nickel, and Zinc.

The effluent samples for Hexachlorobenzene were all non-detectable values. However, the lowest available detection level is well above the WQBEL. The Department considers a non-detection, at the lowest available detection level, as compliance with a WQBEL. If the Department obtains further information that would indicate that the presence of Hexachlorobenzene is likely, the permit will be reopened and the appropriate monitoring and limits will be included.

**Backsliding/Anti-Backsliding:** All parameters in the proposed permit are identical or more stringent than the limits in the previous permit, therefore backsliding is not occurring.

**Effluent toxicity:** The Department is incorporating acute toxicity limits and testing into the permit as per IAC 567-63.4.

The dilution percentages for effluent toxicity testing specified in the WLA are: 15.3% of the effluent and 84.7% of dilution water for the acute WET test. This frequency is based on the low flow stream conditions. This dilution percentage was used to ensure no toxicity regardless of stream flow conditions.

An annual monitoring frequency is specified in the permit.

**Monitoring Basis:** Compliance and operational monitoring are based on Chapter 63 IAC, Tables II and III, Category >105,000 (PE based on the additive design BOD loadings for the Easton and Satellite facilities). Acute WET test requirements are based on IAC 567- 63.4(1).

**Special Monitoring:** BOD5, Ammonia – Nitrogen and *E.coli* sampling requirements are specified on the Special Monitoring Requirements page of the permit.

**Sludge:** Sludge must be land applied according to Chapter 67 IAC land application rules or otherwise disposed of in accordance with the Federal regulations in 40 CFR 503. No adverse environmental or public health impacts have been identified.

**Compliance Schedule:** None.

**Pretreatment:** The City's Pretreatment Program was approved on March 14, 1984. On May 14 and 15, 2014, Naji Ahmad, EPA, Region VII, conducted an inspection of the program. Mr. Ahmad concluded that the City must provide the appropriate staff to complete the Industrial Waste Survey, evaluate its local limits, and evaluate its approved Pretreatment Program for compliance with the streamlining regulations.

The City of Waterloo has reorganized and now has additional staff to work on the Pretreatment Program.

The local limits were reevaluated and submitted to the Department on December 23, 2014. An approval of the local limits was issued March 12, 2015.

The Industrial Waste Survey's must be conducted at a minimum of once every five years and whenever the industrial base changes significantly.

The permit also proposes that the City evaluate the approved pretreatment program to evaluate compliance with the general pretreatment regulation in 40 CFR 403 and the state's pretreatment rules in IAC 567 – 62, specifically with regards to the pretreatment streamlining rule published in the Federal Register on October 14, 2005. The City shall submit a report detailing the evaluation and proposing modifications as necessary to address any deficiencies that are identified.

The report requirements are listed on the major contributing industries limitations, monitoring, and reporting requirements page of this permit.

**Administrative Order:** None.

**Comments:** The permit contains a requirement for the City to conduct a two year feasibility study to determine the facility's ability to remove nutrients (total nitrogen and total phosphorus). The requirement is in based on the 2013 Iowa Nutrient Reduction Strategy. The facility is required to evaluate the feasibility and reasonableness of reducing the amounts of nitrogen and phosphorus discharged into surface water.